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the Supreme Court of the United States

OCTOBER TERM, 1972

No. 71-485

OBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
PETITIONER

v.

GARY R. BENSON AND ARTHUR C. TABBOTT

RIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

REPLY BRIEF FOR THE PETITIONER

Although respondents insist that the invention h they claim here is a "machine process," see , pp. 3–5, they refer in their brief more than two times to the "PBX" telephone system which have developed and to which they allege that this t application relates. The pervasive suggestion ghout their brief is that the mathematical em for converting binary-coded-decimal numbers pure binary numbers for which they now claim a t monopoly is limited to use in their PBX ratus. At times, respondents appear almost to

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suggest that the patent they seek here is similar to a patent on the PBX machinery itself.

Examination of the claims which respondents made in the Patent Office, and which are now before this Court, however, shows that the monopoly which they seek is in no way limited by reference to the PBX device, and, in fact, can only be interpreted through extrapolation to contain an apparatus limitation embracing the very broad category of digital computers or other data processing devices.[1] Respondents suggest that the lack of express limitation in their claims can be made up for by study of the potential application of their invention in the light of "technological realities." In so arguing, they rely on the doctrine that the specification[2] may be used in construing the claims of an already-issued patent. (Resp. Br. 17–18 and n. 14). In considering an application for a patent, however, the Patent Office is entitled to rely on the doctrine that the applicant's claim is the measure of the grant (see Pet. Br. 29). In order to protect the public from any attempt by respondents in the future to expand their claim, the Patent Office is authorized, and indeed, required, to recognize only the express

[1] Respondents now claim that the data processor must be an "electrical", rather than a "hydraulic" or other "non-electrical" device (Resp. Br. 17, 25). This newly-asserted limitation is unsupported by any language in their claims (see Pet. App. 38–39, 40–41), and is, in any event, trivial (see Pet. Br. 25–26).

[2] The specification is the illustrative and descriptive section of the patent application which demonstrates the utility of the claimed invention. See 35 U.S.C. 112.

limitations claimed in the patent itself.[3] Under this standard, the claims at issue here and the patent monopoly at stake are on a general method of BCD-binary conversion, for any purpose, limited at most to use in a digital computer; they are in no conceivable way limited to a PBX telephone system or the method of operating it.

2. Respondents attempt to distinguish their claimed algorithm from a mathematical theorem by applying to it the label "machine process". The label does not change the fact that, as shown in the Appendix (*infra*, pp. 13–18), respondents' mathematical discovery and new technique for converting BCD numerals into pure binary numerals by the strategic placement and addition of 1's is no more than multiplication in binary by the decimal number ten (binary 1010). And their algorithm, discussed at length in their brief, is no more than a translation into computer programming of a set of multiplications by binary 1010.[4] Whether called a "machine process" or any other name, their procedure no more varies from their mathematical theorem than the translation "deux et trois" differs from "2+3."

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[3] *Siegel* v. *Watson*, 267 F. 2d 621, 623 (C.A.D.C.); *Application of Kebrich*, 201 F. 2d 951, 954 (C.C.P.A.); *Application of Prater*, 415 F. 2d 1393, 1404–1405 (C.C.P.A.); *Barry* v. *Brenner*, 256 F. Supp. 96, 98 (D.D.C.).

[4] Indeed, respondents' algorithm is barely more than a translation of the definition of a BCD numeral from the language of mathematics to that of computer programming, analagous to a translation of "2+3=5" into "deux et trois font cinq" or "0010+0011=0101".

If the mathematical theorem itself is unpatentable, and respondents now appear to concede that (Resp. Br. 24), then translating it into a computer algorithm or program no more imports patentability than it does to convert the equation "$A=\pi r^2$" into a computer algorithm for determining the area of a circle. The algorithm is as abstract as the equation, and even if they are the products of inventive genius, which is immaterial here, neither has the tangibility necessary for a monopoly grant under our patent system.

Respondents imply throughout their brief that their claimed "machine process" is more than a mere algorithm or theorem because the mathematical process that it embodies is likely to be carried out in a machine, *i.e.*, a digital computer or other data processing device. But if a translation of an unpatentable mathematical principle could itself become patentable, it could only do so by reason of a further inventive ingredient, such as a novel and unobvious device for carrying out the translated principle, or if a conventional device were used then a new and unconventional synergism or cooperation between the conventional device and the translation of the mathematical principle. Here there is no new device used to carry out the algorithm which translates respondent's theorem into computer language; the program is carried out on a conventional computer or data processor. Nor does the algorithm or program synergize with the computer in any unconventional way; they co-act with one another the same way any program and computer co-act. (Cf.

Anderson's-Black Rock, Inc. v. *Pavement Salvage Co., Inc.*, 396 U.S. 57; see Pet. Br. 26–27.)

Respondents' allegation that their theorem and its translation into an algorithm give the general purpose computer "a function that it would not otherwise possess" (Resp. Br. 40, n. 35) amounts to a play on words, for the function of a general purpose digital computer is to solve problems "by actually doing arithmetic" in the manner specified in a program embodying an algorithm.[5] The computer does not acquire a new function, in any sense recognizable by the patent law, every time it is programmed to perform a different set of arithmetical calculations, any more than a player piano acquires a new function each time it plays a new song. The algorithm therefore has no inventive status beyond that of the mathematical theorem that it embodies and translates. Since the latter is concededly unpatentable, so too is the former. See, *e.g.*, *Armour Pharmaceutical Company* v. *Richardson-Merrell, Inc.*, 396 F. 2d 70 (C.A. 3).[6]

3. In support of their argument that the absence of apparatus and end use limitations is not fatal to their

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[5] Benray, *Understanding Digital Computers* (1964), p. 4.

[6] Respondents misunderstand the government's references to synergism and obviousness. We do not contend here that the patent should not be granted because respondents' mathematical theorem is obvious. We contend that the patent should not be granted because (1) what it claims amounts to a direct translation of their theorem into another language (that of computer programming) and (2) there is no additional claim of an unobvious implementing device nor any synergism between a device and the algorithm that raises the claimed algorithm above the unpatentable status of a theorem.

the things to be done to them removed the claimed processes from the realm of abstract ideas to the tangible realm with which our patent system is exclusively concerned (see Resp. Br. 23–24 and n. 19; Pet. Br. 17–21).[7]

On the other hand, the manipulation and transformation of intangible entities—such as electrical energy for telecommunication (as in *The Telephone Cases*, 126 U.S. 1, and *O'Reilly* v. *Morse*, 15 How. 62), or information or data processing (as here)—necessarily does *not* involve physical substances on which physical acts are performed; as a consequence, in claims for methods in this area the lack of machinery or apparatus limitations which was acceptable in *Corning*, *Cochrane* and other cases cited by respondents becomes fatal to patentability, for without these limitations the scope of the claimed monopoly cannot be determined by the Patent Office or subsequent competitors, and the grant embraces any tangible application of the idea that others may subsequently invent. For this reason the Court in the *Morse* case struck down Morse's eighth claim (Pet. Br. 22 and n. 22), for the method of printing characters at a distance by use of electricity. At the same time, however, the Court upheld Morse's first claim, which was a method claim almost identical to his eighth claim except for an apparatus limitation on the process. The important difference in claim 1 was that the teleg-

[7] Furthermore, such processes usually contain inherent end use limitations which confine the monopoly over application of the claimed methods to a specified field of technology. See *infra*, pp. 10–11.

raphy process was to be monopolized only "when developed by the action of such [electrical] current or currents, *substantially as set forth in the foregoing description of the first principal part of my invention,*" 15 How. at 85, 112 (emphasis supplied).[8] Though the *Morse* case and *The Telephone Cases* do not state the rule, in so many words, that patents on processes which do not involve the manipulation and transformation of physical materials from one physical or chemical state into another, must contain limitations confining the monopoly grant to the practice of the method by means of particular types of apparatus, we submit that the cases follow such a rule—implicitly or explicitly—and that they cannot be rationalized otherwise.[9]

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[8] The language "substantially as set forth" was deemed to limit the claim to the described machinery. Cf. *Seymour* v. *Osborne*, 11 Wall. 516, 547.

[9] The respondents' discussion of *The Telephone Cases* (Resp. Br. 25, 28) ignores the fact that Bell claimed his method of telephony only as practiced with the magneto or variable resistance apparatus. The Court said that perhaps no other useful apparatus would in fact be invented by others, so that as a practical matter Bell's method of using magneto or resistance apparatus might actually command a total monopoly over all telephony. But as the Court properly observed, that did not make Bell's claim one for all telephonic use of electricity—Bell had claimed no more than he discovered, which was the method of practicing telephony by means of the magneto or resistance apparatus that he had conceived.

Respondents, in our view, simply misstate *The Telephone Cases* when they assert (Resp. Br. 28, n. 24) that a method claim was upheld there which was not confined to any particular apparatus. The infringers used the variable resistance method (see 126 U.S. at 314), and they attempted to have the Court confine the patent to the magneto apparatus and the

We also contend, as in our main brief, that the cases show that a process patent, such as respondents seek here, must be confined to a specified field of technology, such as telegraphy, telephony, or the operation of railroad trains (Pet. Br. 21–24). Without such limitations the scope of the governmental grant of monopoly is both unforseeable and beyond the applicant's inventive contribution, to the injury and prejudice of the public. The degree of definiteness required in an end use limitation is, of course, difficult to define precisely. Respondents assert, without support, that our position here logically requires that we insist on end-use limits as narrow as the use of a telephone system for withdrawing cash from banks (rather than telephony alone or cash-withdrawal systems alone) (Resp. Br. 28). Their argument proves no more than we have already conceded—that the question is a matter of degree, and that the precise point at which the line is to be drawn is unclear (Pet. Br. 22). But that is a familiar problem in many areas of law (see, *e.g.*, *United States* v. *National Dairy Co.*, 372 U.S. 29). In any event, wherever the line may be, respondents' claims are not limited to any field of technology at all. Data processing is not an adequate end-use limit; indeed, it is so all-inclusive

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process of using it (*id.* at 537). The Court held that the process claim covered the telephonic use of both the magneto apparatus and the variable resistance apparatus, although Bell had perfected and indicated a preference for only the magneto method (*id.* at 538). It therefore ruled that it would not confine Bell's monopoly merely to the magneto means he had "improvised to prove the reality of his conception," but would protect him against infringers whose telephony method used the variable resistance apparatus, as well (*id.* at 539).

as to embrace any application of a program whatsoever and therefore furnishes no limitation at all. Similarly, the end-use limit of BCD-binary conversion [10] has no more significance as applied to a program for BCD-binary conversion than would an end-use limitation on a patent for the Pythagorean Theorem confining the monopoly to applications involving the calculation of a hypotenuse. It may be that an end use reference to "PBX" telephone systems would have presented the Patent Office with a different case, but respondents have declined to accept such a limitation on the monopoly they demand. Indeed, respondents have neither proposed nor indicated any willingness to place any non-trivial use limitations on their claims.

Respectfully submitted.

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OCTOBER 1972.

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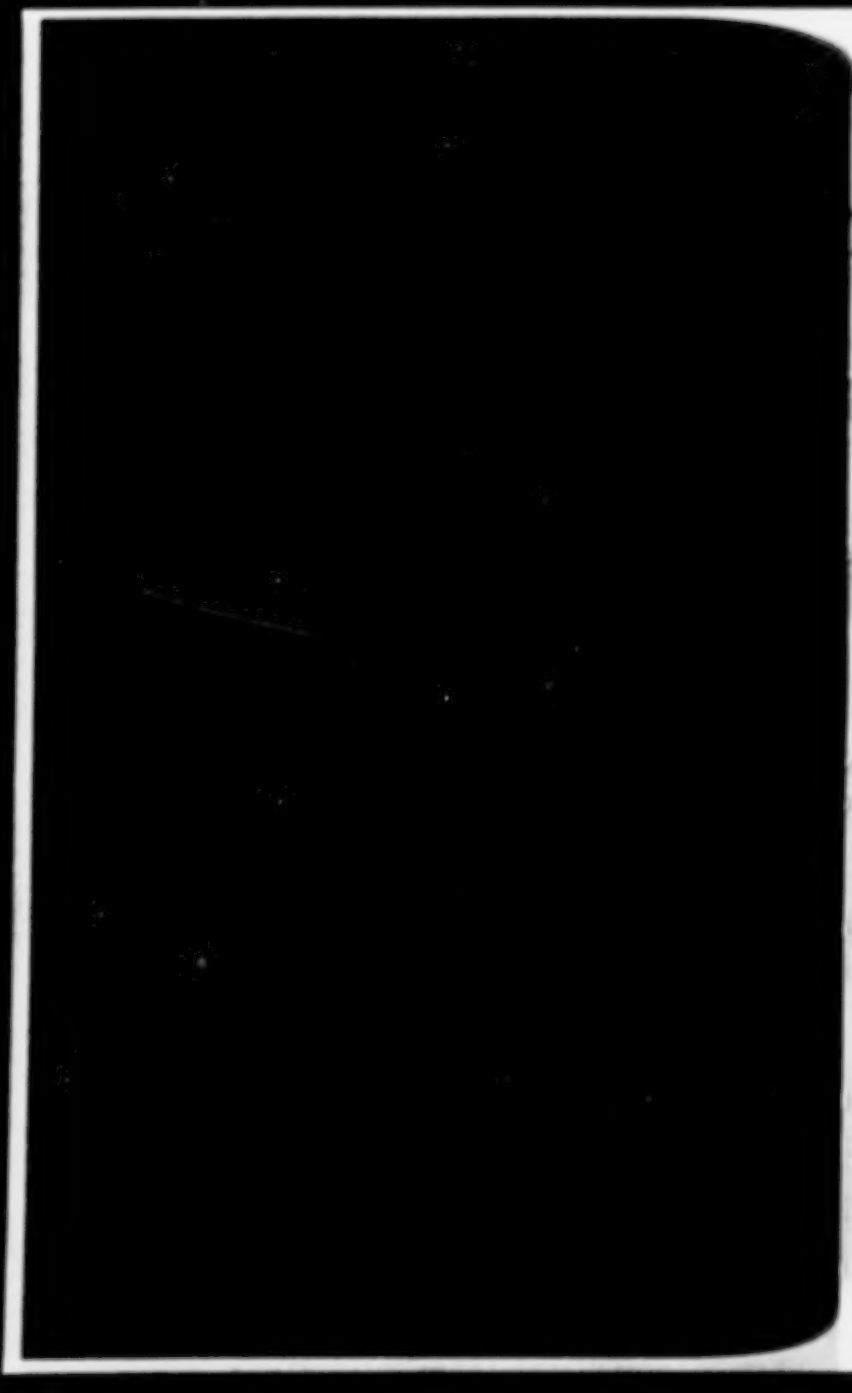
[10] Respondents' assertion (Resp. Br. 6, n. 7) that the "Patent Office has an entire sub-class—sub-class 155 of class 235—reserved for patents covering means of converting numbers in one type of system such as BCD to numbers in another type of system such as binary" and that approximately 75 patents have been issued "for means of converting between BCD signals and binary signals" is misleading. The "means" for which sub-class 155 of class 235 is reserved are machines and not processes. As we have indicated, the distinction between machinery and processes is critical to resolution of this case.



APPENDIX

ANALYSIS OF RESPONDENTS' THEOREM

In describing their mathematical discovery in the appendix to their brief, respondents recapitulate the example, which they developed in the record before the Patent Office, of converting the BCD equivalent of the decimal numeral *53* into a pure binary equivalent; in addition, they use the new example of a similar conversion of *253*. Respondents' analysis, however, as we show below, is merely a recitation and development of the mathematical identities that $53=(5\times10)+3$ and $253=(2\times100)+(5\times10)+3$. The "strategic" placement and addition of *1*'s which respondents claim as their inventive contribution is no more than multiplication in binary by the decimal number ten (*binary 1010*), with the *zeros* treated as blank spaces. Finally, we show that the claimed algorithm is merely a translation of the foregoing principles from the language of mathematics into that of computers.

1. The numeral *253* in decimal positional notation may be rewritten in expanded form as $(2\times100)+(5\times10)+3$. This is also $(2\times10\times10)+(5\times10)+3$. This expression may be further rewritten, by factoring out *10* from the first two terms, as $\{[(2\times10)+5]\times10\}+3$. The translation of the last expression into English is that the number *253* may be thought of as the sum derived by following these steps:

(1) Multiply the digit in the hundreds place (*i.e., 2*) by ten.

(2) Add to this figure the tens digit (*i.e., 5*).
(3) Now multiply the sum, as before, by ten.
(4) Add to this figure the units digit (*i.e., 3*).

2. When the foregoing steps are rewritten in BCD and binary notation, they form the basis for respondents' algorithm. First, the multiplication by decimal ten becomes multiplication by binary *1010*. Second, the multiplications and additions must be performed according to the rules of the binary system. In binary, $1\times1=1$, and any other product is zero ($1\times0=0$, $0\times1=0$, $0\times0=0$). Hence for any number multiplied with *1010*, there is a *1010* corresponding to each digit of that number which is a *1* and nothing (*0*) corresponding to each digit of that number which is a *0*. This is the basis of respondents' alleged discovery of a pair of *1*'s shifted one and three spaces, respectively, from each place where there is a *1* in the *BCD* number. That is:

$$\begin{array}{rr} 0001 & 0010 \\ \times 1010, & \times 1010, \text{ etc.} \\ \hline 1010 & 10100 \end{array}$$

The only difference from this in respondents' notation is that they replace the *0*'s with blank spaces.[1]

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[1] The examples of respondents' technique of adding binary *1*'s "in a particular sequence at designated positions" (Resp. Br. 14a–15a) is readily seen to be a multiplication by binary *1010* according to the rules of binary addition and multiplication. Their first addition step on p. 15a is to add in the italicized *1* of *1010*; their second step is to add in the other *1*. In the third and fourth additions on that page respondents deal with a *1* in the third-from-right-place of the BCD tens digit, rather than one in the right-most place. Accordingly all operations are performed two places to the left of the prior step. (The same thing occurs in ordinary multiplication in the decimal system, where the product for the tens digit of the multiplicand is

The full procedure for converting decimal *253* from BCD form (0010/0101/0011) to pure binary form is therefore as follows: Multiply each portion (going from right to left) of the four-element BCD hundreds digit (*i.e.*, 0010) by 1010,[8] and add the results to the four-element BCD tens digit (*i.e.*, 0101).[9] Multiply each portion (going from right to left) of the results of the prior step by 1010,[10] and add the results to the four element BCD units digit (*i.e.*, 0011). The resulting sum (11111101) is the pure binary numeral which is equivalent to decimal *253* and to BCD 0010/0101/0011. (Compare Resp. Br. 17a–20a.)[11]

3. Respondents illustrate the use in a shift register of the claimed algorithm (Claim 8)—applying it to the conversion of decimal *53* from its BCD form to its pure binary equivalent (Resp. Br. 8a–13a). Comparison of this use of the algorithm with the preceding mathematical derivation shows that the patent claim is merely a translation of the mathematical steps set forth in section 2, from the language of mathematics to the parallel language of computers.

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written down one place to the left of that for the units digit, and the product for the hundreds digit is written down another place to the left.) Since *1010* shifted left two places is the same as *101000*, that is the figure added in here where the *1* occurs in the BCD numeral.

[8] The results are 10100.

[9] The sum is 11001.

[10] The results are 11111010.

[11] Similarly, the full procedure for converting decimal *53* from BCD (0101/0011) to pure binary would therefore be: Multiply each portion (going from right to left) of the four-element BCD tens digit (*i.e.*, 0101) by 1010, and add the results to the four-element BCD units digit (*i.e.*, 0011). The resulting sum (110101) is the pure binary numeral equivalent to decimal *53* and BCD 0101/0011. (Compare Resp. Br. 15a–17a.)

First, the shift register is the standard device for multiplying in digital computers.[6] Each shift to left is equivalent to multiplication by two, *i.e.*, binary *10* (see Pet. Br. 24, n. 25).[7] Three shifts to the left is multiplication by eight (*i.e.*, binary 1000), and taking the sum of one shift and three shifts to the left is adding eight times the shifted number to two times the shifted number, to get a result of ten times the original number (and in binary, 1000+10=1010, so that there is a multiplication by 1010). In this context, we turn to the specific provisions of the claimed algorithm, step by step:

Step 1 of Claim 8—"storing the binary coded-decimal signal in a reentrant shift register"—is nothing more than writing down the BCD number, in preparation for conversion from BCD into binary in accordance with the derivation and algorithm.

Step 2—"shifting the signals to the right by at least three places[8]; until there is a binary '1' in the second position of said register"—constitutes locating the first position that contains a *1* (going from right to left) among the four elements of the BCD tens

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[6] "In binary computers, multiplication is accomplished by a process of shifting and adding." Standard Dictionary of Computers and Information Processing (Weik ed., 1969) (definition of "multiplication").

[7] "A digital product may be formed by additions of the multiplicand [quantity to be multiplied], in accordance with the value of the digits in the multiplier [quantity by which multiplicand is multiplied]. In the case of binary digital multiplication, it is necessary only to shift the multiplicand and add it to the product if the multiplier digit is a one, and just shift the multiplicand without adding, if the multiplier digit is a zero, for each successive digit of the multiplier." *Id.* (definition of "mutliplier, digital").

[8] In applying this step to the conversion of decimal *53* from its BCD form (0101/0011), the first element (going from right

digit,[9] so that it can be multiplied with 1010 in accordance with the algorithm.[10]

Step 3—"masking out said binary '1' in the second position of said register"—is merely erasing the signal in this position, preparatory to writing another symbol in its place during the next stage of the algorithm.[11]

Steps 4, 5, and 6—"adding a binary *1* to the first position of said register"; "shifting the signals to the left by two positions"; and "adding a binary *1* to said first position"—constitute multiplying by 1010 the first of the four elements going from right to left of the BCD tens digit that contains a *1* and adding the

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to left) of the BCD tens digit that contains a *1* (the italicized *1* of 0101/0011) is also the first element of the BCD tens digit. Therefore, the shift in step 2 is exactly three places to the right.

[9] Three shifts of the BCD tens digit to the right moves the right-most element of that digit into the second-from-right ("second") position of the shift register.

[10] The reason for locating the first *1* is that only a *1* need be multiplied, since any *0* when multiplied with 1010 (or anything else) will yield only a *0*.

[11] The conversion procedure erases the BCD form of the number and, at the end of the process, replaces it with the pure binary form. It does this by mathematically "expanding" the BCD numeral into a sum of units, as set forth in sections 1 and 2 of this Appendix. At the intermediate stages of the process, the partially converted numeral in the register is a mixture of BCD and pure binary numerals. During the process the successive elimination of the BCD hundreds and ten places occur, and they are combined (by addition), at the end, with the BCD units place (which is the same in BCD and in pure binary)—see section 1, *supra*. As a consequence, the length of the units part of the numeral keeps increasing as other portions of the numeral are added into it. At the end, what was formerly the units digit of the BCD numeral has become the entire pure binary numeral, and has been progressively lengthened to accommodate the quantities added onto it by the mathematical "expansion" process. In this case of *63*, eight BCD digits are

result of this multiplication to the BCD units digit.[13] See the first paragraph of this section (p. 3a, *supra*).

This completes the operation to be performed on the first element of the four-element BCD tens digit.

Step 7—"shifting the signals to the right by at least three positions in preparation for a succeeding binary *1* in the second position of said register"—is a recitation that the procedure requires that *each* element[14] (going from right to left) of the BCD tens digit must be multiplied by 1010, and then added to the BCD units digit.[15]

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replaced by six pure binary digits; for *253*, twelve BCD digits become eight pure binary digits—in both cases, the last four BCD digits are progressively lengthened by the "expansion" procedure until they represent the entire number and are six or eight digits long, respectively.

[13] In applying these steps to the conversion of decimal *53* from its BCD form (0101/0011), as previously indicated, *supra*, note 8, step 2 shifts the four elements of the BCD units digit three places to the right. Step 4 adds a *1* to the fourth element of the BCD units digit (the italicized *0* of 0101/*0*011) and steps 5 and 6 add a *1* to the second element of the units digit (the italicized *1* of 0101/*0*0*1*1; taken together these steps are: *1010+0011*=1101, where the italicization indicates the numerical elements involved in the steps).

[14] For the conversion of decimal *53* from its BCD form (0101/0011), the next relevant element (and the last one that has a *1*) (going from right to left) of the BCD tens digit is the third position (the italicized *1* of 0*1*01/0011). Step 7 shifts the four elements of the BCD units digit (now converted to 1101 after steps 1–6, see n. 12, *supra*), exactly four places to the right. Repeating step 4 adds a *1* to the sixth element of the units portion of the numeral, and repeating steps 5 and 6 adds a *1* to the fourth element of the same portion. (Compare Resp. Br. 11a–13a.)

[15] Presumably, this is to be done by repeating steps 3–6 of Claim 8, although the claim itself fails expressly to state the need for such repetition. Claim 13, however, does expressly state that need.

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